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Preconditions evaluation in Maritime Clustering research

Rasa Viederyte[a]*

[a] *Dr.Klaipeda University, Herkaus Manto St. 84 Klaipeda, LT-92294, Lithuania*

Abstract

This paper identifies and codifies the main European Maritime clustering preconditions and obstacles according to their significant features, associated with increase of Productivity, Innovations and Competitiveness. The work systematizes features of preconditions specific to Maritime clustering. These features are combined into constructive groups of preconditions in accordance with the impact of preconditions on the increase of Productivity, Innovations and Competitiveness. The obstacles of Maritime clustering are indicated as barriers on the increase of Productivity, Innovations and Competitiveness.

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Keywords: Maritime; clustering; preconditions; productivity; competitiveness; innovations

1. Introduction

Most of the clustering process research is actually associated with a cluster analysis of the results. For example, in 2006 the European Commission (Gallup Europe, 2006) conducted a study which sought to examine the importance of clusters in the European Union and the added value of the EU countries with a virtual business system and in individual business entity, comparing cluster-companies with non-cluster ones. According to the survey results, the cluster operating companies are innovative and constantly develop renewing proposed products or services (63% cluster-companies and 57% non-cluster companies). It was noticed a cluster operating company focuses on continuous market research significance (53% cluster-companies and 33% non-cluster companies), record of innovation patents (29% cluster-companies and 12% non-cluster companies), introduces more innovative products (78% cluster-companies and 74% non-cluster companies) tend to co-operate and collaborate with

* Rasa Viederyte. Tel.: +370 600 44312.
E-mail address: rasavieder@yahoo.com

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universities, research laboratories and innovation in advancing and implementing institutes (41% cluster-companies and 20% non-cluster companies). About 71% of businesses in the cluster functioning welcomes the dependence of cluster system as an opportunity to expand, improve and develop their primary activity, progress in other aspects.

However, in practice the lack of research, which preconditions lead companies to merge in clusters structures, how companies evaluate clustering preconditions in order of priority, what are their main motives for clustering, what can be clustering obstacles, as far as how much obstacles factors are important and significant in decision making, are the organizations stakeholders analyzing clustering preconditions and obstacles at all, etc.

Recently the scientific literature (Jucevicius, 2009; Stalgiene, 2010; Porter, 1998; Rosenfeld, 2002; Roelandt and Hertog, 1999; Simmie and Sennett, 2001; Kamarulzaman and Mariati, 2008, et al.) have been widely analyzed in the world taking place in clustering processes, their measures to promote, discussions about these business systems created benefit to the individual members of the group as well as to the whole Europe region, where the clusters mostly are create on the “bottom-up” approach. Clustering initiatives "bottom-up" still do not receive the proper attention of poolicymakers as well as scientists (Lorenzen, 2005).

Various competitive assessment challenges were analyzed and evaluation methodologies were suggested by Porter (2000a; 2000b; 2003), Andersson and Napier (2007), Andersson et al. (2004) and others. However, there is a lack of research in which Maritime industry clustering is analyzed as productivity, innovation and competitiveness appraisal.

The purpose of the research - to systemize and evaluate European Maritime clustering preconditions.

Methods of research: systemic and comparative analysis and synthesis of scientific literature, strategic documents and legislation; statistical analysis of secondary data; empirical research - expert evaluation.

This paper considers the “precondition” as the initial reasoned argument based on predictions with regard to reasoned evidence of similar facts. This paper analyses the relations of Productivity, Innovations and Competitiveness in frames of clustering preconditions also obstacles and explains meaningful relations between.

2. Methodology

European maritime sector organizations tend to clustering has certain reasons that this work identifies preconditions. These preconditions are not related to the individual interests of the company, but the broader maritime sector needs and opportunities to be clustered. European marine sector clustering preconditions are specific: they are focused on the regional and global maritime sector linkages, relating to the maritime sectors’ available resources, needs, policy and opportunities. European marine sector clustering preconditions and obstacle analysis is optimal by using qualitative and quantitative research methods.

During qualitative research European maritime sector clustering preconditions and obstacles detailed listed options were submitted on separate sheets for each person who participates in Expert-research; experts evaluated each precondition and obstacle by following its the importance while using Likert scale instrument. After collecting the data necessary for the investigation, the preconditions and obstacles correlation analysis is made, the preconditions and obstacle weighted estimates are based on, preconditions and obstacle ranked by following the priority order of importance.

Qualitative methods of use, according to scientists (Czamanski and Ablas (1979), Day and Bobeva (2005), Giovannini (2005) et al.), is a priority if the researcher focuses on individual social object identity, the whole event video or the case, the objective and subjective a factor of unity and interaction study as it is the analysis of European maritime industry clustering preconditions. The qualitative study also allows for consideration of new phenomena or processes. This expert assessment survey type was selected for the qualitative research results validity and reliability. Qualitative research is selected also because it does not require large material costs, allows for consideration of the issue in a broader context, lets get comprehensive information contributes to the theory of creation, when it is not developed, helping to create a new hypothesis explaining the unique facts and exhibits them. The disadvantages of this qualitative research: Analysis of data processing complexity, a lot of uncertainty in the results of generalization problem, huge time and intellectual expenses, lack of control, replay challenges.

European maritime sector clustering preconditions and obstacles are necessary to verify by the statistical estimates. Preconditions and obstacles importance and compatibility check is performed by correlation analysis to verify how many variables and preconditions of obstacle statistically dependent on each other. Correlation is used to perform statistical data processing program SPSS (v.21.0).

The claims, which serve to justify conclusions called reasoning statements or preconditions. There are certain

preconditions indicators. Work author offers three criterions for evaluation of arguments. The first criterion is the acceptability of the preconditions and consistency. The second criterion is the preconditions and general conclusions of the preconditions linkages. During this test case - the preconditions and presumptions obstacles ratio: are correlated with each other preconditions and preconditions obstacles; is preconditions evaluation stronger than preconditions barrier (obstacle); is the preconditions assessment important; which preconditions are relatively the least important; which preconditions obstacles (risk) is highest barriers of productivity, innovation and competitiveness; what the key preconditions and preconditions obstacles were indicated by experts and whether their responses correlated. The third criterion is sensitive parts of the reasoning: if there something that could alter the conclusion that the missing components in compliance with the assessment report.

This argument evaluation criterion is usually considered to be a solid and convincing. Science faced with the findings, which are based on different or only declarative, different reasoning. Therefore, the researcher selected a problem and find a few conclusions can be made as clean most convincing. To have to carry out these analyzes or conclusions of a study carried out in a comprehensive manner, summarizing data from studies conducted.

Analysis of data collected in this work was done by the following methods of data analysis provided below.

Factor analysis - a multivariate mathematical statistical method, normally used to determine the connections between social objects and classifying attributes.

Cluster analysis - experimental data and class clustering method. One class of observations in a sense becomes close to each other. Cluster analysis type of procedure depends on the number of observations. The small size of the sample used for hierarchical and parallel procedures. Hierarchical procedure consistently combines (emits) at the beginning of the very next (farthest), and then - more and more remote (came near) observations. Parallel to the procedure is an one-time report for all observations in each step of the algorithm.

Contextual analysis - the study type, which, together with the individual characteristics of the phenomenon takes into account the context in which the phenomenon depends on the characteristics. These symptoms manifest themselves as independent variables affecting individual volumes or individual modified values of mutual relations.

Correlation analysis – the correlation dependence between two (or more) random signs or factors statistical methods.

Systematic analysis - a set of methodological tools used to develop and justify decisions, solving complex economic problems.

For systematic and representative preconditions analysis execution - scientific literature analysis was made, the strategic analysis of the documents, consultations with experts of the European maritime sector were provided, separate countries maritime sector clustering preconditions exclusionary practices were systemized. As codified preconditions were presented to experts, representing wide-specialized maritime organizations, it was aimed at the description of the preconditions of brevity, but the more detailed description that is clear from various areas. Systematized preconditions were split into 3 groups and presented according to their impact on productivity, innovation and competitiveness. Each group consists of 7 preconditions, total - 21 preconditions. Such preconditions evidence of systematic presentation is conditional, since both the theoretical part provides increased productivity, innovation and competitiveness enhancement factors of mutual entanglement, and the practical part, the empirical study of these factors is observed interdependence and integrity (innovation is associated with competitiveness and it affects productivity improvements, competitiveness is directly linked with the innovative and productive solutions, productivity is the result of innovative solutions and competitiveness determinant). However, the clustering precondition systematization followed for its drafting highlighted productivity, innovation or competitiveness of the factors of influence on their strategic purpose and for highlighting their wording clearer presentation to the experts. Internationalization and efficiency than individual structural categories have been dropped, the interpretation of internationalization as an integral part of the competitiveness and efficiency - part productivity. Systematized clustering assumptions are splitted into 3 groups, each group with 7 assumptions units.

It should be noted that in order to comfort and flexible survey data processing, the first part of the statements is to provide codes (productivity preconditions Pp1-7, innovative preconditions Pi1-7; competitiveness preconditions Pk1-7; productivity preconditions obstacles - Kp1-7; innovativeness preconditions obstacles - Ki1-7; competitiveness preconditions obstacles - Kk1-7), which are used in discussing and graphically reflecting the results of this research.

In the questionnaire there were listed European maritime sector clustering Preconditions on productivity, innovation and competitiveness, and clustering Preconditions Obstacles of productivity, innovation and competitiveness in order of importance each statement was evaluated in the scale from 1 to 5, where: 5 -

precondition is very important, 1 – not important at all, and, assessing Obstacles: 5 - an obstacle is very important, 1 - not important at all.

The data were structured and analyzed while calculating basic statistical indicators, each of preconditions and obstacles to the statistical average, median, mode, standard deviation and variance. There is also presented each of the preconditions and each obstacles ranks throughout the preconditions and barriers within the group and by individual productivity, innovation and competitiveness in groups of preconditions and obstacles, correlation analysis calculated the arithmetic mean, median, mode, standard deviation, variance and grades. The arithmetic average indicates the average character meaning, which is located around the whole set. Median is the attribute value that divides the statistical line into two equal parts. Mode - this is usually a recurring character value statistical line. The standard deviation (SD) shows how each value is an average deviated from the arithmetic mean. Dispersion represents the values of the average scattering. Rank indicates any hierarchical position is the statistical value of the criterion.

3. Results

First part of the questionnaire European maritime sector clustering preconditions and obstacles expert evaluation of the data was organized, analyzed and summarized in the calculation of these statistical indicators, each of European maritime sector clustering precondition (Pp1-7, Pi1-7 and Pk1-7) and obstacle (Kp1-7 , Ki1-7, Kk1-7) provide estimates of the amount, and multipacks place overall grades on scales (Table 1 and Table 2), expert estimates the mean, median, mode (Fig. 1 and Fig. 2), standard deviation and variance (Fig. 3 and Fig. 4).

Table 1. European maritime sector clustering precondition's estimates sum and precondition place in common and group of rank scales

Precondition code	Pp1	Pp2	Pp3	Pp4	Pp5	Pp6	Pp7	Pi1	Pi2	Pi3	Pi4	Pi5	Pi6	Pi7	Pk1	Pk2	Pk3	Pk4	Pk5	Pk6	Pk7
Estimates sum	82	80	72	79	79	84	77	81	67	75	79	74	70	84	80	76	80	79	80	76	78
Common rank	3	5	19	9	9	1	14	4	21	17	9	18	20	1	5	15	5	9	5	15	13
Group	*Productivity increasing*							*Innovations increasing*							*Competitiveness increasing*						
Rank in group	2	3	7	4	4	1	6	2	7	4	3	5	6	1	1	6	1	4	1	6	5

According to the data provided (Table 1) it can be argued that the most important European maritime sector clustering preconditions: Pp6 - "Clustering helps to achieve production economies of scale and scope" (estimates sum = 84) and Pi7 - "In collaboration, representatives of the clustering can reach higher level of innovation by cooperation in the fields of research and technological development" (estimates sum = 84). These preconditions are priorities in order of importance and clustering prerequisites for increasing productivity and innovativeness to enhance areas.

Top assessed (estimates sum = 80, 5th place in the overall ranking and 1st place grades on the competitiveness of the group) to increase the competitiveness of clusters preconditions are Pk1 – " Cooperation gives an opportunity easier, cheaper and quicker to get specialized information about markets, technologies and resources", Pk3 - " Co-operating companies are in a strong bargaining power while searching for new clients and suppliers, dealing with the supply or sales questions, raising and discussing issues relevant to business system at national level, by providing designed applications for financial support or for other favorable business conditions" and Pk5 - "The joint forces help easier to enter to new local and international markets, to compete, maintain and strengthen positions in markets, develop channels of distribution of the production/ services, to look for potential users, customers, suppliers".

Table 2. European maritime sector clustering precondition's obstacles estimates sum and obstacle place in common and group of rank scales

Obstacle code	Kp1	Kp2	Kp3	Kp4	Kp5	Kp6	Kp7	Ki1	Ki2	Ki3	Ki4	Ki5	Ki6	Ki7	Kk1	Kk2	Kk3	Kk4	Kk5	Kk6	Kk7
Estimates sum	71	72	66	68	71	73	62	66	78	71	63	69	71	84	65	63	62	69	68	68	71
Common	5	4	15	12	5	3	20	15	2	5	18	10	5	1	17	18	20	10	12	12	5

rank																					
Group	*Productivity increasing obstacles*							*Innovations increasing obstacles*							*Competitiveness increasing obstacles*						
Rank in group	3	2	6	5	3	1	7	6	2	3	7	5	3	1	5	6	7	2	3	3	1

After data analysis (Table 2), it can be said that the most important European maritime sector clustering productivity, innovation and competitiveness obstacles are: Ki2 - "Cluster activities are poorly regulated by legal framework which does not systematically and completely cover EU legislation and the realization of the strategies and legislative acts of Lithuania" (estimates sum = 78) and Ki7 - "Non- confidence culture in European business is still widespread, European companies are relatively closed for cooperation with competitors, it is difficult to effectively combine interests and mutual benefits. Confidence among the cluster entities is critically important factor in the functioning of the network organization" (estimates sum = 84). These obstacles are of importance and priority assigned to the major innovation of raising barriers. Top clustering obstacles assessed as one of the barriers to productivity are: Kp6 - " Even seeing the total potential benefits of cooperation, companies individually often are reluctant to show the initiative of formation of the cluster and assume the associated costs and responsibility" (Estimates sum = 73, 3rd place in the overall ranking and 1st place for increasing the productivity of obstacles group). Top clustering obstacle assessed as one of the competitiveness is Kk7- "The associated business structures are relatively of limited availability of financing (cost of financing, access to capital and liquidity, confidence in market participants and individual lending strategy of banks)" (estimates sum = 71, 5th place in the overall ranking and 1st place in the competitiveness obstacles).

Accordingly, the highest and the lowest clustering preconditions' expert estimates of averages, which are shown in Fig. 1. It shows the clustering preconditions provided estimates of the mean, median and mode dependency.

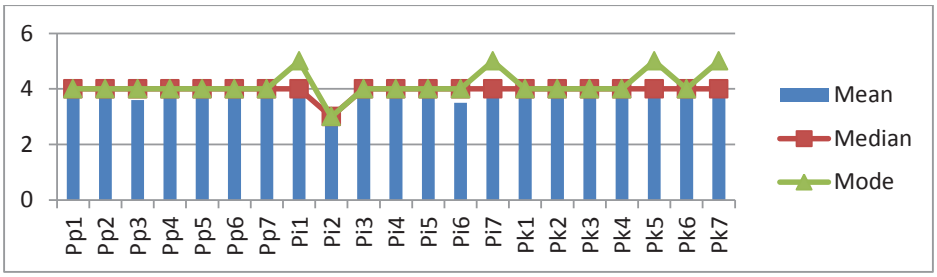

Fig. 1. 1-7 clustering preconditions Pp1-7, Pi1-7 and Pk 1-7 provided estimates of the mean, median and mode dependency

Median (Me) as the largest clustering precondition attribute value that divides the preconditions indicators statistical line into two equal parts, almost all the preconditions character was equal to 4 ("important"), excluding the precondition Pi2 - "There emerges an opportunity to reduce various business obstacles, other costs related to investments, by diversifying these costs between members of business systems" (Me = 3 ("fairly important")).

The most common recurring character value in the sample (Mode (Mo)) in terms of preconditions, have been equal to 4 ("important"), but was higher (Mo = 5 ("very important")) in the evaluation of these preconditions: Pi1- "Favourable conditions are created for transmission - take over of "good practice", to search solutions for solving common problems", Pi7 – " In collaboration, representatives of the clustering can reach higher level of innovation by cooperation in the fields of research and technological development.", Pk5- "The joint forces help easier to enter to new local and international markets, to compete, maintain and strengthen positions in markets, develop channels of distribution of the production/ services, to look for potential users, customers, suppliers" and Pk7 - "Cooperation between companies increase foreign direct investment opportunities", and lower was (Mo = 3 ("quite important")) for assessing the precondition Pi2 - "There emerges an opportunity to reduce various business obstacles, other costs related to investments, by diversifying these costs between members of business systems".

Accordingly the highest and the lowest clustering obstacles' expert estimates of averages are shown in Fig. 2. It also shows the clustering obstacles provided estimates of the mean, median and mode dependency.

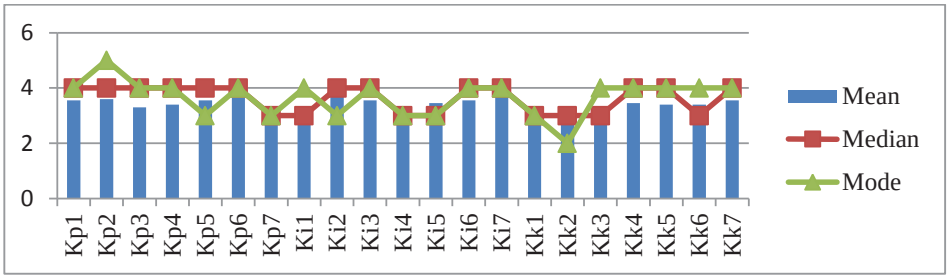

Fig. 2. Clustering obstacles Kp1-7, Ki1-7, Kk1-7 provided estimates of the mean, median and mode dependency

Median assessing the obstacles of clustering features, in most cases (13 obstacles items) was equal to 4 ("important"), far less (8 obstacles items) - 3 ("fairly important"). Mode, assessing the obstacles of clustering features, in many cases, was equal to 4 ("important"), but was higher (Mo = 5 (“very important”)) for assessing the obstacle characteristics: Kp2 - "Raising additional questions on contributions of property, for example, question on results of investment projects and division of property of created infrastructure”, but was lower (Mo = 2 ("almost irrelevant")) for assessing the obstacle of Kk2 - "There is a rise in likelihood to buy the product / service at higher than market prices. There is a possible threat of cartel agreements”.

Clustering preconditions Pp1-7, Pi1-7 and Pk1-7 provided estimates of the standard deviation and variance dependence presented in Fig. 3. It should be noted that the signs of preconditions estimates the standard deviation and variance (as a dispersion of values around the average) values ranging between [0,6863; 1,2096] and [0,4711; 1,4632] range. This suggests that the preconditions estimated the deviation from the mean value and the variance of the average values are quite high.

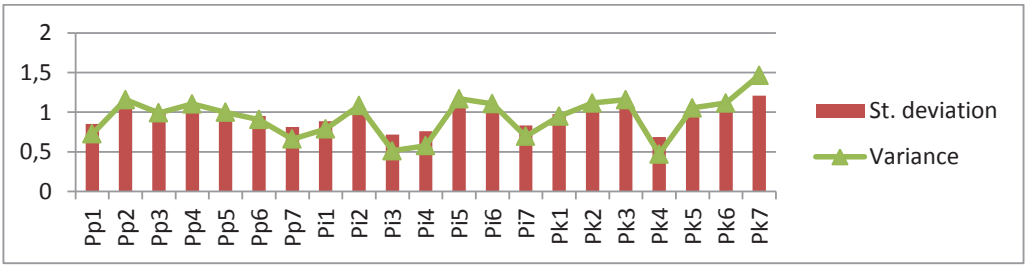

Fig. 3. Clustering preconditions Pp1-7, Pi1-7 and Pk 1-7 standard deviation and variance dependence

The biggest and the smallest signs of clustering preconditions estimates the standard deviation (σ) and variance (σ^2) to capture these preconditions group signs: in productivity group the maximum value assigned to the preconditions item Pp2 – “The ability to specialize and focus on the main activity by transferring secondary and additional activities to the sector members who specialize in these activities” (σ = 1,0761 and σ^2 = 1,1579), while the lowest value Pp7 - "Companies working together are in common marketing, distribution strategy and reduction of logistics costs” (σ = 0,8127 and σ^2 = 0,6605); in innovations group, the maximum value assigned to the preconditions item Pi5 - “In cooperation there is on going promotion of research and experimental development (R&D) and there is an opportunity of commercialization of higher education products (prototype) developed"(σ = 1,0809 and σ^2 = 1,1684), while the lowest Value - Pi3 - "During the sector clustering processes, the socialization is promoted and community-based culture is developed between companies" (σ = 0,7164 and σ^2 = 0,5132); in competitiveness group the maximum value assigned to the preconditions item Pk7- "Cooperation between companies increase foreign direct investment opportunities” (σ = 1,2096 and σ^2 = 1,4632), while the lowest value - Pk4 – “The advantages of geographical concentration of enterprises and access to the shared infrastructure facilities emerge (Port, infrastructure of rail, roads and ferries)”(σ = 0,6863 and σ^2 = 0,4711).

Clustering obstacles Kp1-7, Ki1-7 and Kk1-7 provided estimates standard deviation and variance dependence presented in Fig. 4. It should be noted that the evidence of the obstacle estimated standard deviation and variance (as

a dispersion of values around the average) values ranging between [0,7881; 1,1910] and [0,6211; 1,4184] range. This shows that the obstacles estimated the deviation from the mean value and the variance of the average values are quite high.

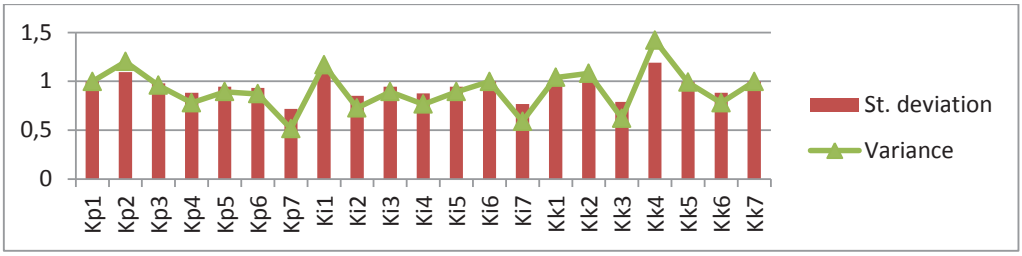

Fig. 4. Clustering obstacles Kp1-7, Ki1-7, Kk1-7 standard deviation and variance dependence

The highest and lowest obstacles of clustering features estimates standard deviation (σ) and variance (σ^2) to capture these obstacle groups signs: increasing productivity obstacles group the maximum value assigned to the obstacles item Kp2 - " Raising additional questions on contributions of property, for example, question on results of investment projects and division of property of created infrastructure" (σ = 1,0954 and σ^2 = 1,200), while the lowest value - Kp7 - "The additional administrative and financial burden - maintenance of cluster governing body and funding of additional package of strategic action: costs for organization of meetings, costs for administrative facilities, marketing techniques and so on"(σ = 0,7182 and σ^2 = 0,5158); increasing innovations obstacles group the maximum value assigned to the obstacles item Ki1- "In practice non-functioning business information systems - are the main obstacle for the dissemination of information. Low awareness of business entities about other businesses in the same region, about opportunities to provide specialized services, about available technologies, implemented projects and other regional business information stop clustering process" (σ = 1,0809 and σ^2 = 1,1684), while the lowest value - Ki7- "Non- confidence culture in European business is still widespread, European companies are relatively closed for cooperation with competitors, it is difficult to effectively combine interests and mutual benefits. Confidence among the cluster entities is critically important factor in the functioning of the network organization"(σ = 0,7678 and σ^2 = 0,5895); increasing competitiveness obstacles group the maximum value assigned to the obstacles item Kk4 - "An obvious exclusiveness and isolation of region, the lack of accessibility and lack of dissemination of good practice specialists and other elements essential for clustering" (σ = 1,1910 and σ^2 = 1,4184), while the lowest value - Kk3 – "Different level of technologies and management between separate business entities is related to dissatisfaction of progressive businesses about the quality of additional provided services of other businesses due to low technological and managerial levels"(σ = 0,7881 and σ^2 = 0,6211).

4. Conclusions

After summing up the results it can be concluded that the assessment of these preconditions are considered to be the clustering process catalysts, because they evaluative qualification of the pores with a obstacle occurred as the most significant. It can be concluded that the main maritime sector clustering preconditions are associated with the promotion of innovation policy and innovation in development cooperation, "good practice" transfer and strengthening bargaining power.

It is proposed to pay particular attention to the provided obstacles as productivity, innovation and competitiveness barriers, because their estimates of weighted rates are higher than other preconditions and estimates of the weighted indicators. So it can be concluded that the preconditions underlying the clustering realize the obstacles are linked to poor legislative framework, advanced technology and intellectual property protection, uncertainty and mistrust between the companies.

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